THE DIFFERENTIAL EFFECTS OF ALTERNATING SCHEDULES OF FEEDBACK ON EMPLOYEE PRODUCTIVITY

An abstract of a Thesis by
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The problem. Although feedback has improved performance in a number of settings, little attention to date has been devoted to the temporal aspects of feedback including frequency of schedules of feedback. The present study investigated schedules of feedback and their effect on productivity of an underwriting department of an insurance company.

Procedures. A system of weighting production behaviors was established and individual worker performance feedback was begun on a weekly basis and increased to every other work day. Subsequently, social reinforcement was added to feedback. Quality and management cost were measured concurrently with productivity.

Findings. Neither weekly or every other day feedback were effective in improving productivity. The addition of social reinforcement raised productivity back to baseline levels. Quality was not adversely affected. There is potentially a high payoff for management cost if procedures are effective.

Conclusions. The method for weighting production did not account for seasonal variations in the difficulty of the workload. Thus, it was impossible to prove the effectiveness of the procedures.

Recommendations. Future studies of complex production behaviors must have a valid basis for equating seasonal variations in the difficulty of the workload. In addition, goal setting should be considered in addition to feedback and social reinforcement.

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CHAPTER I

INTRODUCTION

The decline in the growth rate of worker productivity (Journal of American Insurance, 1982) has been one of the great concerns of the 1980's. Much of the discussion to date has centered on high profile manufacturing industries such as the automobile industry where the need to become competitive in world markets is so apparent.

However, C. Jackson Grayson, Jr., who is chairman of the American Productivity Center in Houston, Texas, said, "Productivity applies just as much to insurance as it applies to General Motors or General Electric." (Journal of American Insurance, 1982) The American Productivity Center predicts that by 1990, nearly 90% of all employed Americans will be working in either white collar jobs or in service sector occupations (JAI, 1982). Yet, while the role of white collar jobs is increasing in a major way, white collar productivity has failed to keep pace even with manufacturing productivity. In fact, the Bureau of Labor Statistics indicates that insurance industry productivity is now declining (JAI, 1982). From 1948 to 1965, the growth rate in insurance and finance averaged 1.3% per year, but from 1965 to 1973, it dropped to 1.2%. From 1973 to 1979, it fell two-tenths of a percent and in 1980 it declined 3.1% (JAI, 1982).

Unlike manufacturing, which has high capital investments for each worker, the insurance and financial industry

is a people intensive industry with low capital investment per each employee. A typical manufacturing industry will have between $25,000 and $50,000 invested per worker, while the average office worker is backed by only $2,000 worth of capital equipment which includes office machines and computers (JAI, 1982). An implication of this is that gains in productivity are much more dependent upon making the individual worker more productive, assuming no great breakthroughs will be made in office automation.

Productivity is a major concern of the author's employer, a large midwestern insurance company. Direct expenses, the largest single item of which is salaries and employee benefits, have been rising rapidly and as a result concern with productivity is increasing. Productivity in this instance is defined as the ratio of output over input with input including payroll, equipment, and building. This company has emphasized work measurement and performance improvement so it is quite receptive to strategies to increase productivity.

The rapid growth of organizational behavior management (OBM) has been noted as an approach to organization change as documented in such publications as the Journal of Organizational Behavior Management after 1977. Of a variety of OBM strategies, performance feedback has been one of the more widely used interventions (Prue & Fairbank, 1981). There are a number of reasons for this.

One of the primary advantages of performance feedback is its relatively low cost to an organization. Another advantage of performance feedback is simplicity of implementation. Lengthy and sophisticated managerial training programs to use feedback are seldom needed. Feedback used on a systematic basis increases positive control over behavior resulting in greater productivity without using aversive control procedures such as punishment. Finally, feedback can be used where the use of other interventions is quite limited. For example, monetary incentives often cannot be used because of union contractual considerations or where the setting of precedents could create problems with equal treatment.

A recent study of all issues to date of the Journal of Organizational Behavior Management found that 60% of the studies employed performance feedback (Prue & Fairbank, 1981). There are a number of possible variations to the type of feedback and the context in which it is given. Prue and Fairbank (1981) identified five parameters of feedback:

(1) Recipients of feedback -- Studies in this area would focus on the intended audience of feedback and whether feedback is given publicly or privately.

(2) Feedback mechanism -- the basic types of feedback, such as verbal, written, mechanical, or self-recorded, are examined in studies in this area.

(3) Content of feedback -- This concerns the type of

information given recipients and includes such issues as whether an individual's performance is compared to his prior performance, with a group performance standard, or comparison of a group's performance to other similar group performances, and so on.

(4) Temporal characteristics of feedback -- This involves the questions of when and how often feedback should be given.

(5) Source of feedback -- This is the question of who delivers the feedback. Organizational relationships are often a factor including the differential effects of feedback delivered by immediate supervisors, peers, or managers of higher rank.

A review of recent literature regarding feedback reveals a wide range of feedback applications, most of which reported successes in increasing productivity. Kirby (1977) found that feedback of results versus goals on histogram charts coincided with production increases in three manufacturing plants. Another application of histogram charts for feedback of results in a salvage operation was followed by a 42% performance level increase over baseline levels, although this increase level was not maintained over the duration of the research (Stoerzinger, Johnston, Pisor & Monroe, 1978).

McCarthy (1978), reported a successful application of

performance feedback to a group on a declining error basis. The group was able to reduce errors ("High Bobbins") on the goal lines set and reversal was attained when the feedback was removed. The author attributes a large part of the success of the project to verbal feedback and reinforcement which was in addition to visual graphic feedback.

The interaction of goal setting and performance feedback and the impact of goal setting and goal setting plus feedback was examined by Kim and Hamner (1976). The results showed that goal setting alone could enhance productivity in the absence of a formal knowledge of results program. When feedback was added to goal setting, performance was generally enhanced. This study also manipulated the richness of feedback in examining the effect upon production and it was generally found that extrinsic feedback added to intrinsic feedback (the maximum feedback condition) produced higher results. Another study looking at the differential effects of feedback and feedback with praise was reported by Brown, Willis, and Reid (1981). They reported verbal feedback plus approval got better results than verbal feedback alone.

Prue, Krapfl, Noah, Cannon, and Maley (1980) conducted a feedback intervention program to increase treatment behaviors of a mental hospital staff. In this example, three types of feedback were successively introduced with each one having an additive effect in increasing hospital staff

treatment behavior. Two types of administrative feedback were used, as well as a public display chart of treatment changes.

Brown, Malott, Dillon, and Keeps (1980) looked at the relationship between training programs and feedback where the goal was to increase the frequency of several customer service behaviors in a department store. They learned that a training program was ineffective by itself, but that adding feedback produced substantial improvement in the frequency of all of the targeted customer-service behaviors. Geller, Eason, Phillips, and Pierson (1980) also reported minimal and short lasting behavior increases with training, but substantial effects when feedback was introduced as an intervention. These studies taken together suggest that training programs without follow-up feedback and/or reinforcement for behaviors taught may produce very disappointing job performance results.

An area which has been lightly treated in the research conducted to date is the temporal effects of feedback. This would include not only the proximity of feedback to the occurrence of behaviors reported, but also the schedules of when feedback occurs. This would include the issue of immediate versus delayed feedback. Another aspect of schedules is the question of "rich" versus "thin" schedules where minimal versus maximum feedback is given.

In the literature to date, Krumhus and Malott (1980)

combined immediate and delayed feedback in staff training with modeling of appropriate behaviors. This study suggested that feedback following a modeling procedure may produce slight improvements in performance and that immediate feedback was no more effective than delayed feedback. There was some question as to whether ten minutes delay is distinguishable from longer time periods in terms of the delay-of-reinforcement gradient. In any event, the question of timing of feedback was obscured by the simultaneous manipulation of other variables including the use of modeling as a training procedure. The authors suggested that additional research was needed to compare the effects of feedback which occurs less than ten seconds after the completion of the subject's response with that which occurs 23 hours later.

Ford (1980) developed a classification system for feedback procedures. He suggested that feedback could be classified according to contiguity of feedback with performance and could be either relatively immediate or delayed. In addition, schedules of feedback could vary from one minute or shorter to one year or longer at the extremes. Ford's (1980) data demonstrated the usefulness of his proposed classification system but shed little light on the relative effectiveness of either variation in contiguity or schedules of feedback. Finally, Dillon, Kent, and Malott (1980) reported the results of a system for supervising the completion of relatively long-range projects

which last for six months or longer. This program employed heavy use of weekly feedback, but did nothing to compare weekly feedback to feedback given on other time schedules.

Perhaps performance feedback schedules as used in OBM could be considered analogous to response independent schedules of reinforcement which are also known as time schedules. In this research, feedback is given on a pre-determined time schedule which has no contingent relationship to the level of response. Feedback on productivity responses is independent of the level of productivity.

Operant literature on animal behavior reports a number of findings regarding the behavior following various time schedules of reinforcement. Pecking behavior in pigeons follows the density of food delivery in the same way on non-contingent as in response contingent schedules. That is, a richer schedule of reinforcement produces greater pecking behavior (Staddon & Simmelhag, 1971). Additionally, Zeiler (1977) reported that "Time schedules maintain a lower response rate than do interval schedules." Generally, interval and time schedules maintain the same patterns of responding with temporal patterns of reinforcer deliveries controlling the patterns of responding (Zeiler, 1977).

In summary, in the large number of studies employing feedback, little or no research has been reported where temporal aspects of feedback were the focus of study.

Research has not thoroughly examined the role of schedules of feedback. The present study examines schedules of feedback as they affect the productivity of an underwriting department of a large midwestern insurance company.

CHAPTER II

METHODS

Subjects

The subjects for this study are six female clerical workers assigned to the farm underwriting department. The subjects are designated rater/coders with responsibilities of calculating rates for various types of property and casualty insurance policies covering agricultural operations and property. The subjects are all high school graduates and have from one month to nearly four years of experience. Other employees of the department are the departmental manager, an underwriter (assistant manager), a clerical unit supervisor, and two trainee rater/coders. The trainees joined the department while the study was in progress so while data on their productivity was recorded, they were not part of the experimental study. Later they became aware that their processing productivity was monitored.

Setting

The farm underwriting department is located in an open office area 30m x 33m with desks lined up in several rows. Each rater desk is equipped with a cathode ray tube (CRT) terminal which is used for computer processing of insurance information. Other equipment includes several files, tables, and telephones on the underwriting desks.

The department is responsible for processing applications for insurance coverage on various agricultural risks. Each employee processes a mix of the various types of policies written by the department and performs one of several actions such as issuing a new policy, completing an endorsement, processing a renewal, or cancellation of a policy. The volume of business has been increasing from year to year to the point that management had become concerned about the ability of the department to keep up with a growing work load and to continue to provide acceptable service to the agency force. The department had little history of objective work or performance measurement until March 1982 when the manager installed a daily processing count procedure. In addition, an informal daily work quota of 25 items per day was set. Feedback of results was not done except to discuss department performance in general terms during infrequent departmental meetings with words such as "we are making progress in reducing the work backlog" or, "most of you are making the daily processing goal." The department was forecasted to have a continuing heavy workload for at least twelve months due to a conversion to a new computer processing system.

Target Behaviors

The daily processing count was tracked at various periods during 1982. Beginning September 1, 1982, baseline performance was measured. This followed a change in

processing methods on August 1, 1982. The item count of units of production was given various weights in order to adjust for differences in complexity and difficulty of various types of processing operations. A study was done by the company to determine the average processing times for various types of policies depending on whether the operation was new business, a renewal, a cancellation, or a policy which required an endorsement. Table 1 lists the weights used based on ten minutes as the basic time unit.

The prime behavior of interest was the weighted value of various items processed during normal working hours. Productivity during overtime hours was not tracked because not all employees worked overtime or the same number of hours of overtime.

Data were collected on the following collateral behaviors:

1. Machine error rates. Error levels were tracked to assure that work quality was not adversely affected by the introduction of the experimental interventions. Machine errors are errors that are detected by a computer edit process. Errors are assigned back to the rater/coder making the error for correction. The correction of an error is not counted as an item processed so in effect, error correction is an offset against other production.

Table 1

Processing Weights

Processing Tasks	Time	Weight
Endorsements	10 Minutes	1.0
CP Application or Renewal	10 Minutes	1.0
Liability Application or Renewal	12-15 Minutes	1.5
Liability Machine Conversion	4-5 Minutes	0.5
Cancellation	10 Minutes	1.0
Corrections	10 Minutes	1.0
CIM, Application or Renewal	10-15 Minutes	1.5
Animal Mortality	15 Minutes	1.5
FMP Conversion Application or Renewal	36 Minutes	3.5
FMP Update only, Application or Renewal	16 Minutes	1.5
FMP Input only, Application or Renewal	20 Minutes	2.0

2. Overtime worked. Overtime is an indication of department efficiency and currency of service and is scheduled when service fails to meet pre-established time standards.
3. Weekly department input. This was the total of incoming work such as applications, renewals, and endorsements.

Procedures

There was a mix of experience and ability between farm underwriting department rater/coders. Gilbert (1978) proposed the concept of the PIP (Potential for Improving Performance) which appeared applicable to this case where there was a range of employee performance. Gilbert defines a PIP as the ratio of the historically best performance (exemplar) to typical performance. The PIP serves both as an index of the potential for performance improvement, wherein each employee is considered to have the capacity to produce at a level approaching the exemplar, and also as an index of improvement since the previous PIP computation. A PIP of 1.6 for weighted items processed was obtained in conditions prior to the implementation of the baseline phase of this study. This indicates that the best performer was producing at a level 60% higher than the typical performer which gives ample room for improvement of typical performance. The PIP was periodically calculated during all conditions of the experiment.

The focus of this study was the differential effects of various schedules of feedback on employee productivity in the processing of various insurance policies and forms. Schedules were of interest for several reasons:

1. It has been demonstrated that feedback alone can result in increases in production. Animal experimental studies have suggested that more frequent schedules of feedback are associated with higher rates of response (Staddon & Simmelhag, 1971). Would this also be true of the workers in this study?
2. Can the effects of alternative schedules of feedback which are independent of supervisory verbal approval be demonstrated in a practical way?
3. The provision of feedback by a manager takes administrative time which is a behavior cost. Is there an optimal schedule which provides the best mix of increased productivity for a given behavior cost?
4. What is the effect of the intervention on quality as measured by error rate? Is an increase in productivity obtained at a cost of error increases?

Design

This study used a reversal and multiple baseline design that incorporated independent variables ABCDAD where A represents baseline conditions, B, C and D the experimental

interventions.

Baseline I

During Baseline I, no programmed manipulations were introduced. Baseline data were obtained from processing count reports submitted at the end of each work day by each subject. These data allowed for computation of raw production counts as well as a weighted count.

Feedback, Thin Schedule

On a weekly basis each employee was shown her individual production count on both a raw and weighted basis compared with department average. The daily department production was graphed on a chart and individual daily production was plotted on a clear plastic overlay. The assistant department manager provided feedback in terms of showing each subject her processing record as compared with the department averages. This was rigidly scripted as employees received a brief explanation on how to interpret the charts but no other evaluative comments were made.

Feedback, Rich Schedule

In this phase, each employee was shown her individual production chart on an every other work day basis. Again, no evaluative comments were made to employees.

Feedback Plus Social Reinforcement

The rich schedule was maintained but in addition to feedback, employees were given social reinforcement.

The social reinforcement was added when feedback in either schedule alone failed to increase productivity. The assistant manager received training in giving social reinforcement. Social reinforcement was given on every positive indication shown by the data. If any employee exceeded the department average, she was praised for the accomplishment. Employees whose productivity trends were positive were praised and encouraged to keep the trend heading in a positive direction. No aversive or punishing communication was attempted. If the current data were not positive, positive past performance was reiterated. Feedback plus social reinforcement was continued until the data stabilized.

Baseline II

Feedback and social reinforcement was withdrawn although daily processing records were maintained. The withdrawal was continued until the data stabilized.

Feedback Plus Social Reinforcement, Rich Schedule

The schedule of feedback plus social reinforcement was reintroduced on a multiple baseline basis. Two groups of three employees each were randomly selected and feedback plus reinforcement on rich schedule was reintroduced with one group and then for the second group. A study of the productivity of these two groups showed they were remarkably evenly matched with no significant difference in average weekly production.

CHAPTER III

RESULTS

Department Productivity and Overtime

Group mean productivity as measured in weighted production units and total departmental overtime for each phase of this study is shown in Figure 1. During the 25-day baseline period, mean daily employee weighted productivity was 34.5 units. Feedback intervention was introduced on a weekly (thin) schedule and continued for four weeks. Five occasions of weekly feedback were given. During this condition, weighted mean productivity decreased to 29.7 units per employee per day.

Feedback on a "rich" schedule (FbII) of every other work day commenced on November 8. This schedule was maintained for sixteen work days during which seven instances of feedback were given. During this condition, weighted mean productivity decreased to 29.6 units per employee per day.

On November 30, social reinforcement was added to the enriched schedule. The assistant manager offered verbal praise for improvements in production, maintaining a high level, or production which exceeded the group's average. The mean weighted units of production increased from 29.6 to 37.9 during the seventeen work days during which feedback and social reinforcement were given. Productivity rose 27.8% from the rich schedule feedback period which proceeded the introduction of social reinforcement.

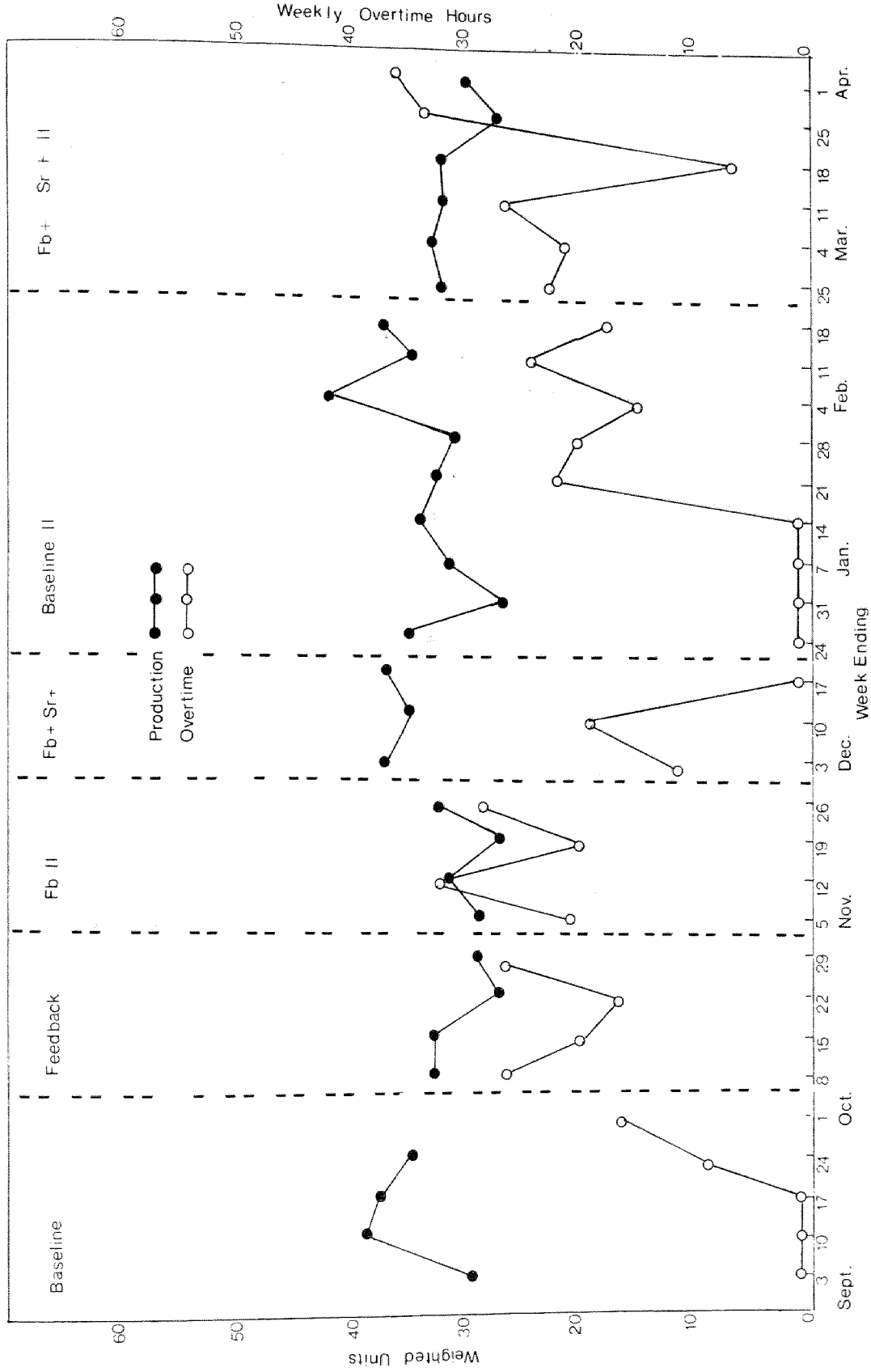

Figure 1. Mean daily production per employee and total departmental overtime hours.

Feedback and social reinforcement were withdrawn on December 22. Production fell sharply from the near forty unit level to at or below the thirty unit level and remained at that level for the next eight work days. It should be noted, however, that Christmas and New Year holiday weeks fell during that period and were not considered normal work weeks as the amount of incoming work to the department was also down significantly, as shown in Figure 2.

After completion of the year-end holiday period, productivity again rose and leveled out between 32 and 35 units. It remained at this level for 20 days then rose to 43 units average for the week ending February 4. During the next two weeks, average daily employee productivity was 37 and 39 units. Social reinforcement was reintroduced on a multiple baseline basis on February 22 with the second of the two groups of three randomly-selected employees and was continued on the rich schedule of every other day for 15 days (see Figure 3).

Mean productivity of the intervention group (Group Two) averaged 1.4 weighted units per day higher than Group One which remained in baseline during the 15 day period. This difference was not statistically significant ($\underline{t}(28) = .76$, $\underline{P}>.05$). The intervention was re-established for Group One on March 14. Productivity remained stable the first week, decreased the second week and recovered to the former level the third week (see Figure 3).

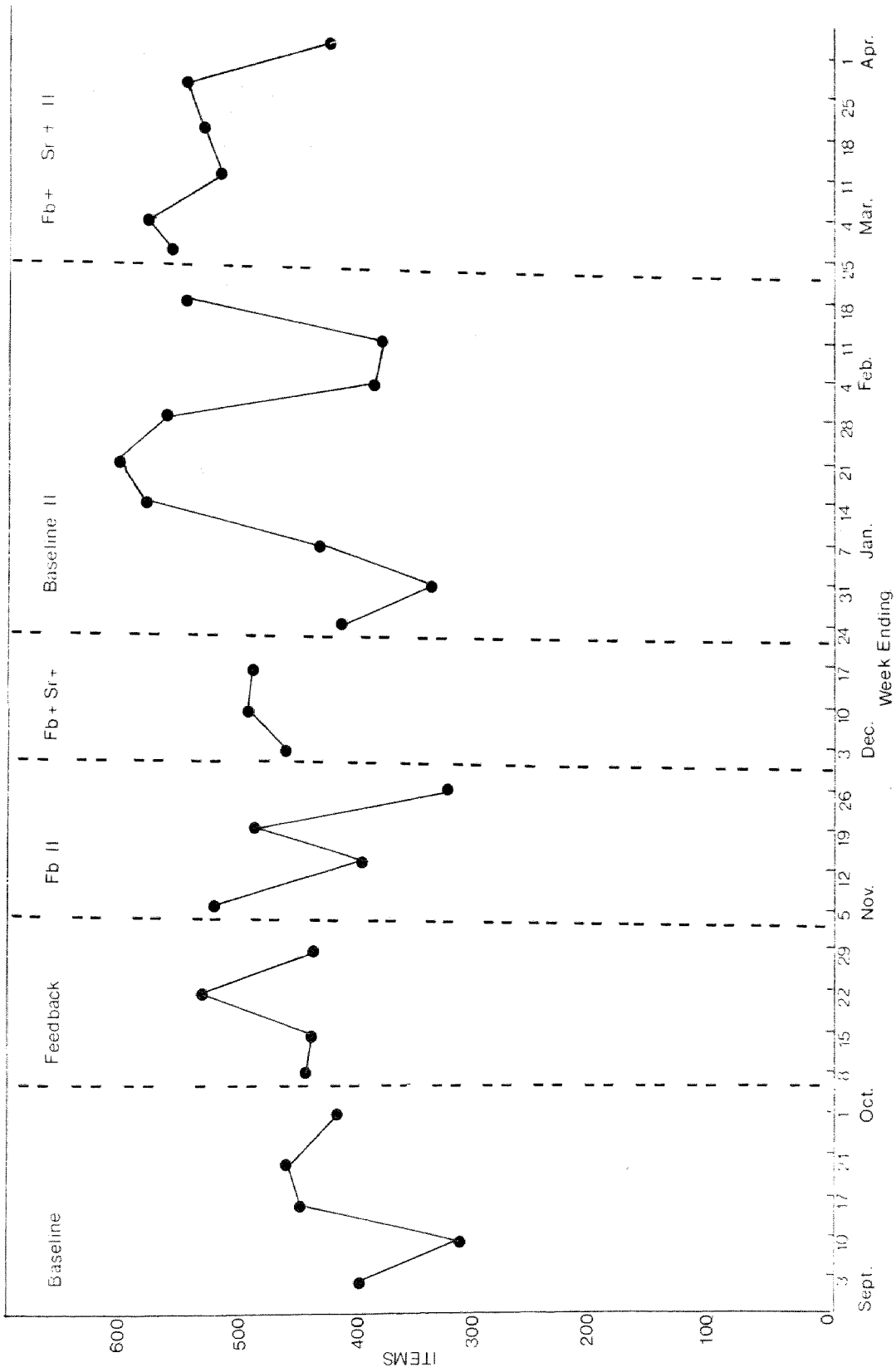

Figure 2. Weekly farm underwriting workload.

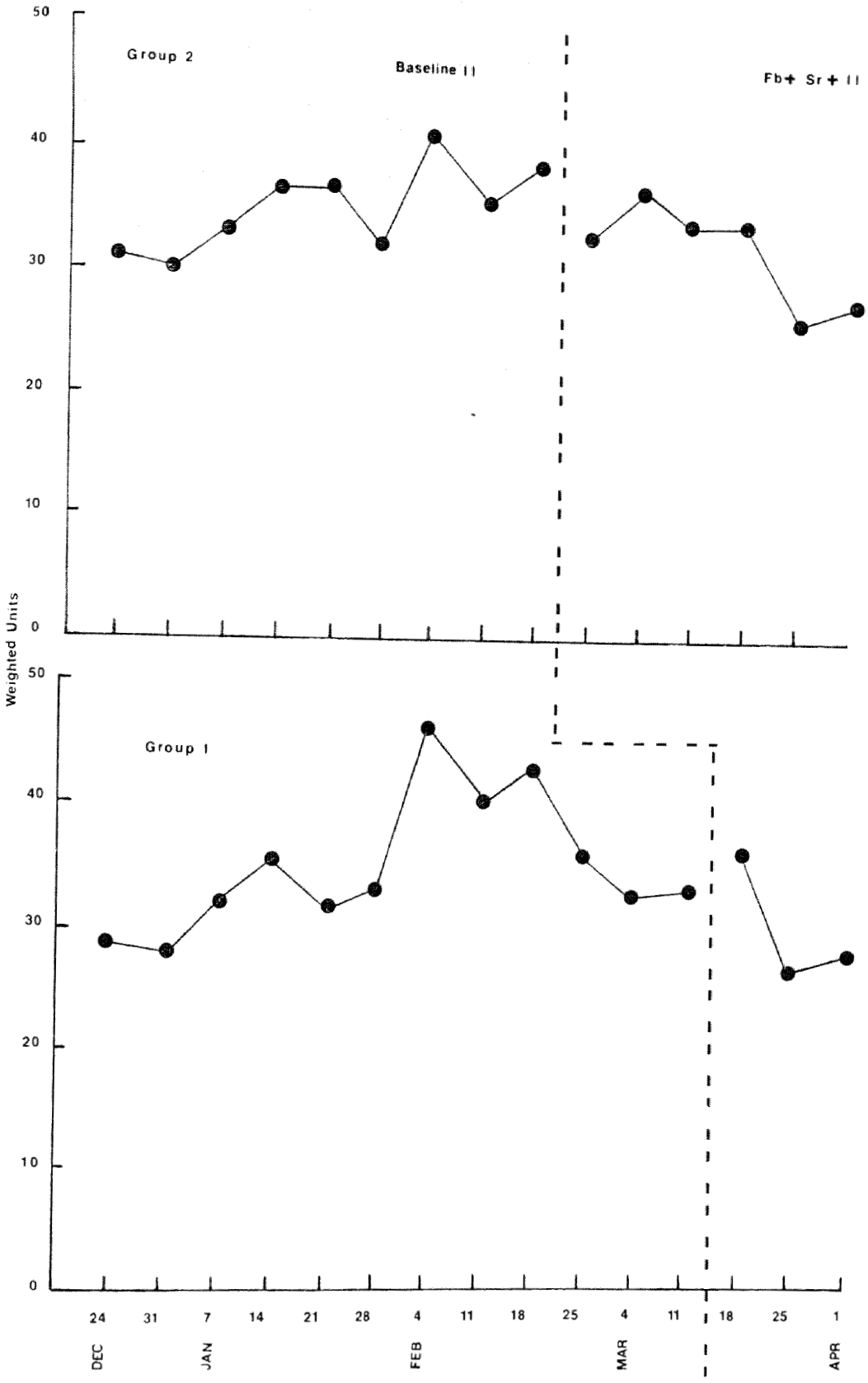

Figure 3. Multiple baseline.

Overtime tended to be scheduled in inverse relationship to productivity and a direct relationship to workload. That is, little overtime was scheduled during the high productivity baseline I period but twenty or more hours per week was required during feedback conditions I and II. The requirement for overtime decreased during feedback plus social reinforcement condition which was a high productivity period and remained negligible into baseline II. The need for overtime increased as the general departmental workload trended upward beginning with the week ending January 7. Overtime was again scheduled the week ending January 21 and was scheduled throughout the remainder of baseline II and the multiple baseline condition of feedback and social reinforcement.

Performance Improvement Potential

Performance improvement potential (PIP) was computed during each condition of the experiment and is presented in Table 2. The PIP ranged from a low of 1.38 in baseline I to a high of 1.66 in feedback and social reinforcement II.

Individual Productivity

In addition to departmental productivity, data was maintained on each subject in the form of a feedback graph which compared the subject to departmental productivity. Summaries of mean daily production by week are shown for three representative subjects and are shown in Figures 4, 5, and 6.

Table 2

Performance Improvement Potential (PIP)

During Conditions of the Experiment

Conditions	PIP
Baseline	1.38
Feedback, Thin Schedule	1.55
Feedback, Rich Schedule	1.52
Feedback & Social Reinforcement	1.48
Baseline II	1.57
Feedback & Social Reinforcement II	1.66

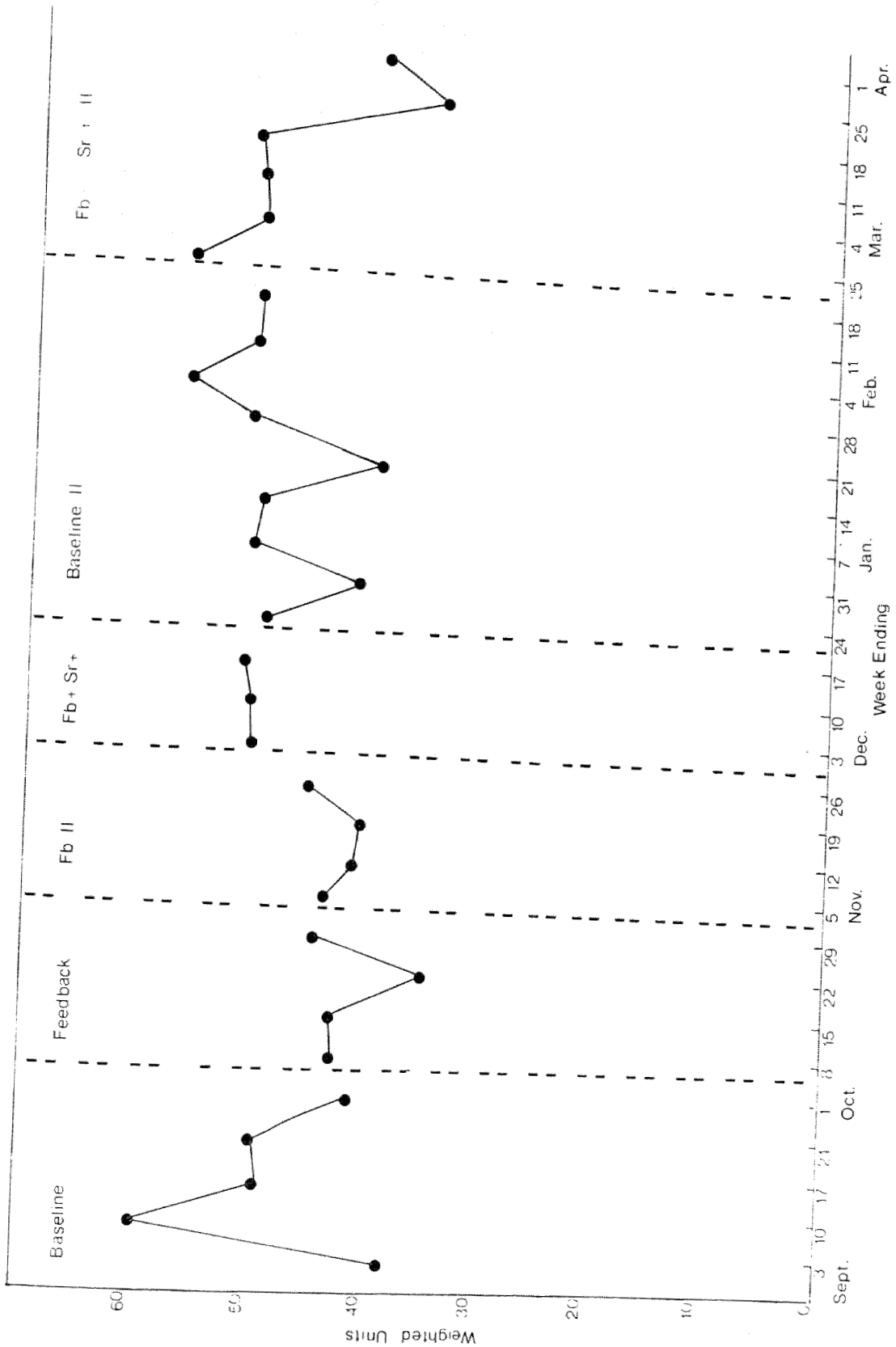

Figure 4. Mean daily production for subject 3.

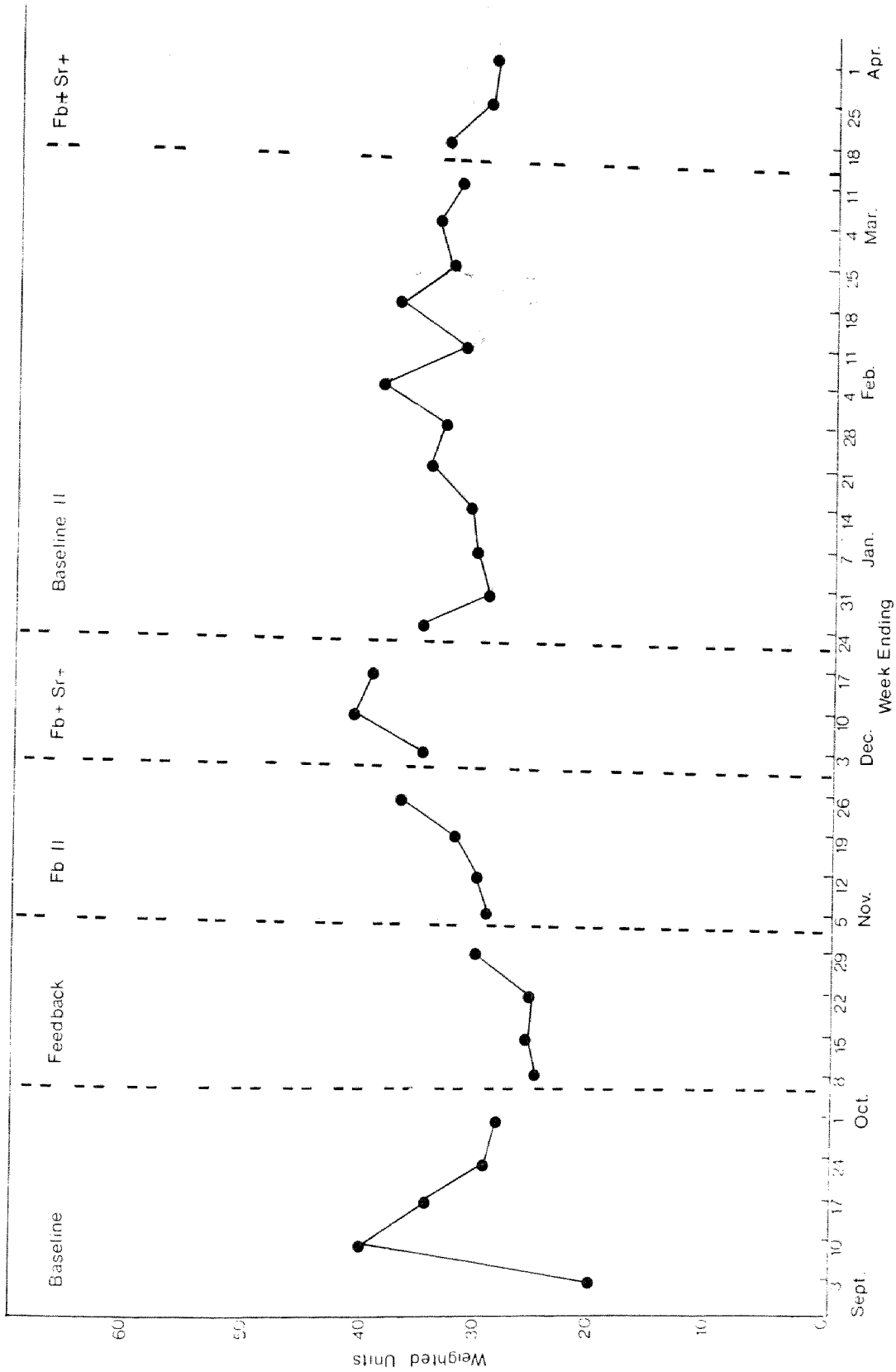

Figure 5. Mean daily production for subject 5.

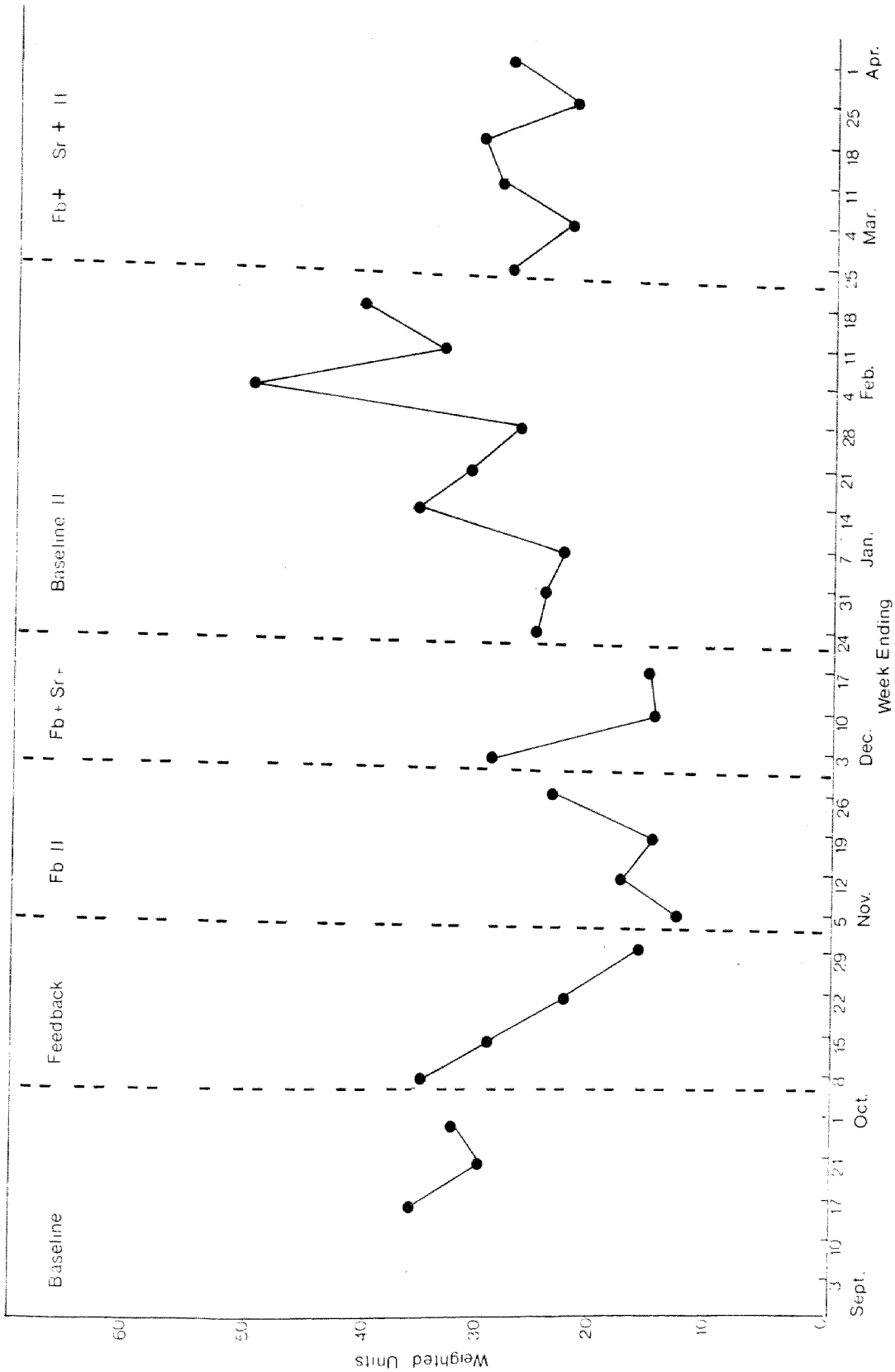

Figure 6. Mean daily production for subject 6.

Subject Three was the departmental exemplar whose productivity consistently led the department average by a margin of 50 to 60%. Figure 4 shows a general increase through the experimental conditions as well as the period of reversal to baseline conditions. Subject Five had typical performance near the bottom of the department at the start of the experiment and gradually increased production to a point at which she was hovering near the department average and on a number of days, she exceeded the department average. A third subject, who was a newcomer to the department (Subject 6), also showed a general trend of increase in productivity (see Figure 6).

The remaining three subjects showed no clear pattern or trend of productivity increase or decrease. They had a great deal of weekly fluctuation, however.

Quality

Quality of work was measured on a weekly and daily basis. The automated computer processing system provided a daily report of machine processing errors. Monthly error totals for each employee were divided by that employee's total units processed to calculate an error rate. Table 3 shows monthly employee machine error rates. Error rates ranged from a low of 2.3% to a high of 4.1% on a monthly basis. Two employees had error rates near 1% while two employees had error rates exceeding 5%. Error rates at or under 3% were considered acceptable by the company's standards.

Table 3

Monthly Percentage Machine Error Rates

Subjects	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Mean
1	0.0	1.4	1.5	2.5	1.2	0.3	0.9	1.3
2	4.7	5.8	5.7	8.0	9.8	3.7	1.2	5.7
3	0.8	0.5	0.6	1.8	0.6	1.2	1.8	0.9
4	4.1	4.8	1.7	3.6	4.4	2.5	1.6	3.2
5	2.5	4.0	5.3	3.6	4.2	3.3	5.4	4.1
6	6.4	7.4	5.3	6.4	4.1	4.8	4.9	5.5
Mean Totals	2.7	4.0	3.5	4.1	3.7	2.3	2.6	3.2

Administrative Time

Records were maintained on the amount of administrative time required to keep productivity and error records, prepare feedback charts, and to give the actual feedback and social reinforcement to employees. This is important information because worthy performance in terms of management action is, according to Gilbert (1978), a function of the ratio of valuable accomplishment to costly behavior. Table 4 summarizes behavior costs associated with administration of feedback and reinforcement.

It was determined that during the fifty-three days in which the first experimental interventions were employed, the average daily cost of the assistant manager's time was $4.66. During the period of November 30 through December 22, average daily production of the six subjects increased 27.8% over the period of October 7 through November 29. The expenditure of administrative time during the November 30-December 22 (which was associated with feedback plus social reinforcement) averaged $3.11 per day. The gain in production (27.8%) translated into a value of $80.81 based on the total daily wages including fringe benefits of the subjects. The cost/benefit ratio for each dollar of administrative time was $25.98 of added productivity for each dollar of administrative time.

This assumes that the gain in productivity was a result, at least in part, of the experimental intervention.

Table 4

Management Behavior Cost Analysis

Experiment Phase	Work Days	Asst. Mgr. Cost	Asst. Mgr. Daily Cost	Avg. Daily Productivity	% Inc.
Oct 7-Nov 3 Fb, Thin Schedule	20	$120.81	$6.04	$29.73	
Nov 4-Nov 29 Fb, Rich Schedule	16	73.33	4.58	29.64	(0.3)
Nov 30-Dec 22 Fb + Sr +, Rich Schedule	17	52.88	3.11	37.95	27.8%
Total	53	$247.02	$4.66		

Productivity Gain x Total Daily Payroll, Subjects = Productivity Value Added

$$.278 \times \$290.68 = \$80.81$$

$$= \frac{\text{Productivity Added}}{\text{Behavior Cost}}$$

$$= \frac{\$80.81}{\$3.11}$$

$$= \$25.98$$

Of course, when the production level of the feedback plus social reinforcement condition is compared to the original baseline in September and early October, the levels are quite comparable and no improvement is shown.

CHAPTER IV

DISCUSSION

This study initially attempted to examine schedules of feedback on employee productivity. However, feedback on neither the thin nor rich condition improved productivity over the original baseline. In fact, it fell substantially. It was only when social reinforcement was added to feedback that productivity returned to a level comparable to the original baseline (see Figure 1). Although productivity rose nearly 28% over the feedback only conditions, comparison to the original baseline level makes it far from clear that feedback plus social reinforcement was the cause of the increase in productivity over the feedback only conditions.

There are a number of factors which may account for these results. In this study, feedback was implemented first on a thin schedule. It was felt that the additive effect on productivity could be determined by starting with infrequent feedback and later increasing the frequency of feedback. Fairbank and Prue (1982), however, recommend beginning feedback on rich schedule to quickly familiarize subjects with the nature and content of feedback and bring behavior under maximum control of the performance feedback. As performance stabilizes at desired levels, the frequency of feedback can become less frequent (thinned). Perhaps the initial schedule of weekly feedback was inadequate to

orient the subjects to the feedback and performance relationship.

After productivity stabilized for three weeks in the feedback and social reinforcement condition, a reversal was attempted and the interventions were withdrawn. There was an initial sharp drop in the early phase of the reversal, but this could easily be attributed to year-end holidays which caused two short work weeks and a decline in the departmental workload (see Figures 1 and 2). As workloads increased to high levels after the holidays, so did mean weekly production per employee. Daily production reached 43 units per employee the week ending February 4, which was the highest of the study. Productivity seemed to be responsive to the increased workloads, developing service backlog, and some management actions. Unknown to the author at the time, it was later learned that the department manager had pressed the employees for increased production by scheduling overtime and establishing daily department production goals. It is certainly possible that those factors were influential in achieving the increase.

As productivity did not decrease as expected after the interventions were withdrawn, feedback and social reinforcement were reinstated on a multiple baseline schedule once productivity had stabilized. Productivity of Group Two, which received the feedback plus social reinforcement intervention first, was slightly higher than Group One

during the initial phase, but taking the two groups together over the entire multiple baseline condition, there was no demonstration that productivity was under the control of the interventions (see Figure 3).

Individual employee results showed no consistent pattern. Subjects Three and Five showed very similar trends, although there was a wide difference in their absolute productivity values. Subject Five seemed the most responsive to the interventions. At the beginning of feedback, she reported alarm to learn that she was quite low relative to the department average, but she made steady progress through the feedback and feedback plus social reinforcement conditions in not only improving her own productivity, but also her standing in comparison to the department average. Subject Six also made steady improvement starting with the second feedback condition and continuing into baseline II. However, she started during baseline I as a trainee, so it is possible that the results were influenced more by training and experience than the interventions.

The PIP generally increased through the conditions of the study starting with 1.38 during baseline I and increasing to 1.66 for feedback plus social reinforcement II (see Chart 2). Normally, the PIP would be expected to decrease if the intervention is acting on productivity as other employees become more productive relative to the exemplar. This did not happen and is suggestive that the intervention

was not controlling behavior changes.

Quality, as evidenced by machine error rates, was monitored to see if there was a relationship between productivity and error levels. No clear relationship was found. For example, September was a month of high productivity, yet the mean employee error rate was quite acceptable at 2.7%. December and February were also months of high productivity, but the error rate was 4.1% for December (highest of the experiment) and for February it was 2.3%, the lowest of the experiment. If productivity is under the control of the intervention, which emphasized quantity as opposed to quality, error rates might be expected to increase as productivity increases.

Management time in compiling data and providing feedback cost $4.66 per day (see Table 4). If the productivity gain in the feedback plus social reinforcement condition over the feedback only conditions was a result of that intervention, the payoff to cost would be nearly 26 to 1. Of course, this study does not prove that control was achieved, but if it did, one would have to conclude that feedback plus social reinforcement is a valuable management activity with a high payoff.

In retrospect, it became apparent that there were several design problems with this experiment. First, the study attempted to make feedback independent of information that might be considered evaluative. Feedback was initially

provided in the form of individual employee charts of both employee and departmental mean raw and weighted production. This meant that each chart contained four graph lines--two for departmental production and two for employee production. An explanation of the charts was given at the onset of feedback, but no information was given as to whether management considered the results "good" or "bad." The idea was to let the charts provide the stimulus control and make feedback distinct from social reinforcement so that the effects of schedules of feedback could be determined.

Some possible flaws are suggested, however. Probably not enough explanation and orientation as to the meaning of the charts was given in the initial stages of feedback. The thin schedule added to the problem of understanding the charts. Also, the graphs were probably overly complex as the employee had to interpret four different graph lines in a rather short period of time. The department and employee raw production lines were removed from the charts at the onset of the feedback plus social reinforcement condition. This change may account for some of the productivity change seen in this condition.

Another design problem was that the charts compared each subject's production to the department average. This meant that on any given day some individuals' productivity appeared below the department mean line which could have had the effect of negating the social reinforcement comments.

The final phase of the experiment was flawed in that the reimplementation of feedback plus social reinforcement on a multiple baseline across randomly selected groups was done in an environment in which the persons subject to feedback could talk with persons scheduled to receive feedback at a later date. This could not be controlled or prevented and in view of the results, was not critical to the study.

Finally, a very critical factor which became apparent only upon conclusion of the study was a major defect in the weights assigned to various production tasks. Some weights were set based on the department manager's informal observation and experience with average times to complete various tasks and others were determined empirically after a period of time in which units and task times reported by subjects were averaged. It was not recognized that there were significant seasonal variations in average processing times. This affected the two baseline periods.

The initial baseline (September through early October) and second baseline (late December through late February) were periods in which the workload contained a disproportionate number of policies which could be processed faster than the weightings allowed. Conversely, the month of March is a high volume period in which the workload contained a large number of units of very complex work which takes longer to process than the weights allow. There is no method within the scope of this study to adjust the weights.

Changes in methods resulting from automation of processing posed another problem for the weighting system and the weights had to be adjusted twice for methods changes. This was done on an empirical basis using data on actual processing times and counts.

The source of feedback became an issue in this study. The original plan was for the department manager to provide the feedback to the subjects, but this task was delegated to his assistant, a younger person with less stature in the department. The assistant, in fact, was considered only a step above the trainee classification. Some studies have shown that feedback has been effective when provided by supervisors of varying rank (Chandler, 1977; Sulzer-Azaroff & deSantamaria, 1980). However, Fairbank and Prue (1982) believe that those studies do not properly account for how the status and power of the provider of feedback interact with the history of interactions between recipients and providers. The assistant was observed giving feedback and social reinforcement and was judged competent in the task, but possibly his delivery was not as reinforcing because of his lack of status.

A second change in providers of feedback took place as a result of the untimely death of the assistant. A new person was assigned to the department and, although he was an experienced supervisor, he lacked familiarity with the department operations and the subjects. He performed the

feedback tasks well, however.

Computer down time and days of slow response time can take control of daily productivity away from employees. It was observed that such conditions are random in occurrence and, as a result, this would tend to affect both baseline and experimental conditions about equally.

In conclusion, this study was not able to demonstrate efficacy of pure feedback in either a thin or enriched schedule. Also, the control of the feedback plus social reinforcement was not validated in this experiment. Several possible explanations were explored and it is believed that flaws in the weighting of various processing tasks may be the most relevant reason for the results obtained. This study is suggestive that feedback and social reinforcement has a possible powerful influence on productivity and is a cost effective management activity. Further research is needed, particularly toward weighting complex clerical production tasks. Another tactic of promise in this situation is to combine feedback and social reinforcement with goal setting whereby employees have specific amounts of work to be accomplished (Kim & Hamner, 1976; Nemeroff & Cosentino, 1979). The author recommends that future research take that direction.

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